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Age at Menarche and First Pregnancy Among Psychosocially At-Risk Adolescents

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We sought to determine which factors influence the association between menarche and conception among adolescent study participants (n=1030), who demonstrated an earlier age of menarche than did national samples. Age at first sexual intercourse (coitarche) mediated the relationship between age at menarche and first pregnancy among White girls, whereas gynecologic age at coitarche (age at coitarche minus age at menarche) and age at menarche explained the timing of the first pregnancy among Black and Hispanic girls. Pregnancy prevention interventions to delay coitarche should also include reproductive education and contraception. (*Am J Public Health*. 2008;98:1822–1824. doi:10.2105/AJPH.2007.120444)

Early-maturing females tend to become pregnant at younger ages than do later-maturing females.^{1–4} Speculations about this nonrandom association include the effect of sex hormones,⁵ the schism between rapid physical development and cognitive and psychosocial maturity,^{6–13} and genetic influences.^{14–26} Given the trend toward earlier menarche^{27–29} and the desirability of preventing adolescent childbearing,^{22,30,31} a better understanding of the underlying mechanisms could improve pregnancy prevention interventions for young adolescent girls.

Among nulligravid American girls, Black females tend to mature at an earlier age than do Hispanic and White girls.^{27–29} However, a report by Deardorff et al.⁶ indicates that pregnant Black adolescents had a later menarche than did White adolescents. Whereas the age at menarche for White participants was early by US standards, the age at menarche for Black participants was not.^{6,27–29} This unanticipated finding is intriguing and motivated this analysis.

We speculated that early physical maturation is not an important antecedent of early childbearing among Black Americans because the prime mediator of the relationship between early menarche and early pregnancy, early age at coitarche,⁶ is more normative among Black than among White American girls.³⁰ Accordingly, we tested the hypothesis that in a cohort of pregnant adolescents, coitarche explains the association between menarche and first pregnancy among White girls, but fecundity (i.e., fertility) at coitarche underlies the association between these two events among Black and Hispanic girls.

METHODS

Study participants were a racially and ethnically diverse group (31.4% White, 29.9% Black, and 38.7% Hispanic) of 1030 pregnant, primigravid adolescents aged 13 to 18 years. The primary source of data was the Electronic Report on Adolescent Pregnancy of the Colorado Adolescent Maternity Program.³²

Age at menarche was self-reported, and early menarche was defined as age 10 years or younger.^{27,33} Age at first conception was calculated from the patient-reported date of the last menstrual period and verified by ultrasound examination.³⁴ Early pregnancy was defined as conception at age 15 years or younger.^{22,31,35} Reproductive maturity at coitarche was defined as gynecologic age at first intercourse (age at coitarche minus age at menarche), truncated at 5 years.^{19,33,36,37} Age at coitarche was self-reported; early coitarche was defined as age 14 years or younger.^{7–13} Body mass index was used to assess prepregnant body size and was computed as self-reported prepregnant weight in kilograms divided by measured height² in meters,³⁸ and trichotomized as under-, average, and overweight.³⁹

Summary statistics and Pearson correlations were used to describe the study population and examine the association between study

variables. Mean and proportion comparison tests (the *t* test and analyses of variance for continuous variables and the χ^2 test for categorical variables) were used to test for significant race and ethnic group differences in age at menarche, coitarche, and conception. Hierarchical, forward, stepwise linear regression, with menarche entered as the first block, and the 3 explanatory variables as the second, were used to predict age at first pregnancy. The data were analyzed with SPSS version 14 (SPSS Inc, Chicago, IL).

RESULTS

Age at menarche, coitarche, and first conception are presented in Table 1. Menarche occurred at essentially the same age in all 3 groups. White adolescents reported an earlier coitarche than did their Black and Hispanic peers. Black and Hispanic adolescents conceived at an earlier age than did White adolescents.

Results of regression analyses supported our hypothesis (Table 2). Age at coitarche was the strongest predictor of age at first pregnancy among White girls. The inclusion of this variable significantly decreased the effect of age at menarche, almost entirely mediating the relationship between age at menarche and that at conception. Gynecologic age at coitarche was the strongest predictor of age at first pregnancy among Black and Hispanic girls. The inclusion of this variable in the model enhanced the explanatory power of age at menarche, implying a complex interaction.

DISCUSSION

Although this study was limited by the size and selectivity of the study population, and by the self-reported biases bearing on age at menarche and coitarche, our findings are consistent with prior reports^{5–6}; American adolescents who become pregnant experience menarche at an earlier age than do their nulligravid peers.²⁹ This is particularly true for White girls.

Among Black and Hispanic adolescent girls, gynecologic age was the strongest predictor of age at first pregnancy. Our findings suggest that Black and Hispanic girls may have a higher likelihood of conception than do White girls who engage in the same level of sexual risk-taking behaviors, because they show a longer period between menarche and coitarche. As such, Black and Hispanic girls are more fertile when they begin engaging in sexual activity,

TABLE 1—Chronologic Age at Reproductive Milestones Among Adolescent Girls (N = 1030): Colorado Adolescent Maternity Program, 1991–2005

	Race/Ethnic Group			Total n = 1030
	White (n = 323)	Hispanic n = 399	Black n = 308	
Menarche				
Age, y, mean ±SD	12.0 ±1.4	11.9 ±1.4	11.9 ±1.6	11.9 ±1.4
Early menarche, %	10.5	13.4	15.6	13.1
Coitarche				
Age, y, mean ±SD	14.5 ±1.5 ^a	14.8 ±1.4 ^a	14.6 ±1.4	14.6 ±1.5
Early coitarche, %	50.5	44.6	50.3	48.2
First pregnancy				
Age, y, mean ±SD	16.7 ±1.3 ^b	16.5 ±1.3 ^b	16.4 ±1.4 ^b	16.5 ±1.4
Early first pregnancy, %	30.7	34.8	35.7	33.8

Note. Early menarche was defined as age 10 years or younger. Early coitarche was defined as age 14 years or younger.

^aPost hoc tests revealed that White was less than Hispanic ($P < .02$).

^bTest for trend revealed .03; post hoc analyses revealed that Black and Hispanic were less than White, with $P = .03$ and .05 respectively.

TABLE 2—Prediction of Chronologic Age at First Pregnancy Among Adolescent Girls: Colorado Adolescent Maternity Program, 1991–2005

Group	B	Adjusted R^2	R^2 Change ^a	F	F Change ^a	P
All (N = 1030)						
Step 1: Menarche, y	0.2	4.4		48.1		<.001
Step 2						
Menarche, y	0.5	26.7	22.3	188.0	139.9	<.001
Gynecologic age at coitarche, y	0.5					
White (n = 323)						
Step 1: Menarche, y	0.2	5.5		19.7		<.001
Step 2						
Menarche, y	0.1	24.0	18.5	51.7	32.0	<.001
Chronologic age at coitarche, y	0.4					
Hispanic (n = 399)						
Step 1: Menarche, y	0.2	2.4		10.7		<.001
Step 2						
Menarche, y	0.5	30.1	27.7	86.6	75.9	<.001
Gynecologic age at coitarche, y	0.5					
Black (n = 308)						
Step 1: Menarche, y		5.4		18.4		<.001
Step 2	0.2					
Menarche, y	0.5	27.4	22.0	58.9	40.5	<.001
Gynecologic age at coitarche, y	0.5					

Note. Gynecologic age was defined as age at coitarche minus age at menarche. Step 1 of the hierarchical regression models included, chronologic age at menarche; step 2 included gynecologic age at coitarche, chronologic age at coitarche, and prepregnant body mass index.

^a"Change" indicates improvement in R^2 or F when the second predictor is added.

because it usually takes females 3 to 5 years to become fully fecund after menarche.^{19,24,33,36,37}

Our findings suggest that interventions that focus on delaying coitarche may be counterproductive because they could inadvertently shift early sexual experimentation, which is disproportionately underprotected,^{40,41} into a more fertile period of the adolescent reproductive cycle. Therefore, health care providers need to also provide reproductive education and contraceptive counseling to adolescents. ■

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Contributors

J. Dunbar conceptualized this project, completed the literature review, and assisted with data analysis. J. Sheeder designed the study and completed the data analysis. D. Lezotte oversaw the project and assisted and reviewed data analysis. D. Dabelea assisted with the literature review. C. Stevens-Simon oversaw the project and assisted and reviewed data analysis. All authors assisted in the writing of the article.

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Human Participant Protection

This study was approved by the institutional review board at the University of Colorado Health Sciences Center and by the Colorado Multiple Institutional Review Board (no. 91-428).

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Paternal Smoking and Increased Risk of Infant and Under-5 Child Mortality in Indonesia

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We examined the relationship between paternal smoking and child mortality. Among 361 021 rural and urban families in Indonesia, paternal smoking was associated with increased infant mortality (rural, odds ratio [OR]=1.30; 95% confidence interval [CI]=1.24, 1.35; urban, OR=1.10; 95% CI=1.01, 1.20), and under-5 child mortality (rural, OR=1.32; 95% CI=1.26, 1.37; urban, OR=1.14; 95% CI=1.05, 1.23). Paternal smoking diverts money from basic necessities to cigarettes and adversely affects child health; tobacco control should therefore be considered among strategies to improve child survival. (*Am J Public Health.* 2008;98:1824–1826. doi:10.2105/AJPH.2007.119289)

Tobacco companies have gradually shifted their market from high- to low-income countries, where people are less informed about the health risks of tobacco use and antismoking policies are relatively weak.¹ Among poor families in developing countries, smoking diverts money from basic necessities to cigarettes² and increases the risk of child malnutrition.^{3,4} Environmental tobacco smoke increases respiratory disease in children.⁵ The relationship between paternal smoking and child health has not been well characterized in developing countries.¹ We hypothesized that paternal smoking is associated with higher infant and under-5 child mortality among families in Indonesia.